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User-friendliness and the invisibility of technology

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Abstract

Having worked with user interface design for the last 15 years, I have noticed — in the last 5 or 10 years — what seems to be a trend in renaming the components of human-computer interaction: 'users' are 'people', 'computers' become 'devices' and 'interfaces' should disappear altogether.

Two questions arise: What are the motivations and consequences of such a shift in the terminology in regards to the visibility of technology? Why does that matter?

I will argue that the motivations are ideological and the consequences include blindness to the architecture of the systems under which we operate — which contributes to the making of a society where power balance is extremely asymmetrical. To articulate this, I will briefly examine the history of the computer, its use and the development towards a 'frictionless' interface.

Introduction

The following three statements serve as an introduction to the central issues of this thesis:

> "One of the horrible words we use is 'users'. I am on a crusade to get rid of the word 'users'. I would prefer to call them 'people'."(Don Norman, 2008 – UXWeek)[1]

> "We believe technology is at its very best when it's invisible. When you're conscious only of what you're doing, not the device you're doing it with. And iPad is the perfect expression of that idea. It's just this magical pane of glass that can become anything you want it to be." (iPad Trailer, 2012)[2]

> "The best interface is no interface." (Golden Krishna, 2013 – SXSW)[3]

The changes in the vocabulary are proposed in the name of efficiency and better adequacy of technology (namely, computer technology) to human qualities. They are often attached to the idea of a previously existing, inevitable and immutable order, something that could be described as 'natural'. I argue that these changes reflect not so much the verification of a fact (users are people, in this case) as it reflects an attempt to implement and consolidate a design choice. Designers, marketing gurus and ICT companies want users to be defined as people, computers to be perceived as magical devices and interfaces to stop existing. Any design choice is guided by a combination of practical matters (available technology, budget, deadlines) and an objective (build a house, print a book, design a website, create a product, etc.) according to guidelines (house owners' personal demands, educational principles, marketing briefing, users' familiarity with similar products, etc.).

At this point, I should make clear my awareness of the controversy around the politics vs. artifacts debate.[4] As a designer, I position myself as someone who understands and experiences the design process as a negotiation among several forces. In this sense, artifacts do have politics. That does not mean to say that design always locks up the use, leaving no room for 'undesigned' responses. The degree of possible flexibility in the expected use will depend on specific characteristics of each design. Sometimes these characteristics are the result of intention, other times they are accidental. Either way, every design choice is, to my understanding, subject to intention.

My interpretation of the three statements above is that they represent a complex attempt to camouflage technology — part of a design strategy which consists in denying the existence of a design process. In doing so, they contribute to the dissemination, implementation and acceptance of the idea of this invisible technology as absolutely positive, natural and desirable. However, as I will argue in this thesis, the invisibility of technology is not a spontaneous phenomenon: it is a deliberate — and difficult — goal to achieve, being simultaneously beneficial and prejudicial. In the general discourse there has been a strong emphasis on the beneficial, which ends up hiding the ambivalence of technology as 'a process suspended between different possibilities' (Feenberg, 2002, p.15).

My point is that the change in vocabulary around human-computer interaction, as suggested in the statements above, reinforced by a material translation of those statements into the architecture of devices and technological infrastructures, contributes to an asymmetric scenario where the user loses power. The cultural and socio-economic side effects of technology cannot be addressed, causal connections disappear, knowledge gives way to magic, as I will try to show in Chapter 3. Chapter 2 will be dedicated to examine the camouflage strategy and Chapter 1 will consist of definitions of the terms mentioned in the statements.

Chapter One - What is a computer?

In order to discuss the terminology around human-computer interaction in the context of user interface design and the ongoing trend to 'upgrade' those terms, it seems wise to first define the terms which are being discussed: user, computer and interface. The setting in use for this research is: users are the human beings which are interacting with the computers (giving input, sending commands, retrieving output from the computer through an interface). Static, dictionary-like definitions of the terms are certainly possible, but these usually do not include the historical layers that involve the terms and its meanings - which as I will show is essential in this research.

Within the interaction between humans and computers, each term of this interaction (user, computer, interface) is a component of a relationship, which means that their definitions are intertwined. Both the components and the relationship have changed over time. Not only do they change over time, but also the meanings they aggregate through time are the result not only of technological development, but the application of this technological development on a convenient feature, based on a conceptual model. In my understanding, this means to say that the definition of a computer (or any other technological device) corresponds to the result of a negotiation between social, economic, political and technical aspects, all materialized into the feature. Every one of these aspects has as much importance as the technological development in the implementation of the feature or artifact. Without the conceptual model — better said, under a different conceptual model — the feature might not be relevant, despite the technical possibility to implement the feature. An example could be Google Glass: even though there is no clear reason in its Google+ page [5] why the project has been withdrawn from its programmed launch in mid 2014, its beta program was publicized loudly enough to show that it was not just a prototype waiting for technology to mature until it would be possible to produce it. Google was already encouraging companies to develop applications specially for the glass [6]. Rather, it seems that one of the aspects in the conceptual model was out of place, and it was not technology.

In this chapter, I will point out important moments regarding the development of the relationship between users and computers. In those moments, it is possible to verify this interdependency between technological possibility and ideological pertinence. I argue that technology does not produce anything by itself, autonomous and spontaneously and that it needs humans to translate it into social artifacts according to the models that we define (or accept, depending on one's position in the power chain).

The modern computer

In the following paragraphs, I will contextualize the 'birth' of the modern computer, after which I will briefly examine the history of the computer, pointing out contingent happenings and relevant decisions which were implemented and therefore contributed to the continuous change in what 'computer' means. The user's position, or definition, is also dynamic, from an operator to a consumer, with moments of 'usership' in between.

The principle of the modern computer was described in 1937 by Alan Turing (On Computable Numbers) but the use of tools for aiding computing and calculation

dates back further. But before Turing, those tools were an aid to the computer, who was a human being. Norbert Wiener — later considered father of Cybernetics, who worked on ballistics at the Aberdeen Proving Ground during WWI and the code breakers — the group of cryptanalyst women — from Betchley Park during WWII were all computers and are good examples of change of meaning over time and the importance of the historical context regarding these definitions. Before Turing, computers were humans. In the modern configuration, inaugurated by Turing, computer is a machine. It is clear, then, that the distinction between user and computer is historically produced. Machines took over the computing functions of humans and became synonym for 'computers'.

Fig. 1: Human Computers

Turing's concept of intelligence regarded the ability to perform logical operations — better said, to perform operations that could be translated into the form of 'an instruction table' (Turing, Computing Machinery and Intelligence, 1950). He believed that machines could work like human brains given the necessary amount of memory capacity. Free will would be introduced into machines by the use of randomness. According to Richard Barbrook (2007, p.40), 'Turing became the first prophet of the imaginary future of artificial intelligence.' An imaginary future that would constantly dialogue with a concrete present, where these machines would be 'practical tools and tradable commodities.' If in the present these tools would perform less spectacularly than imagined, the future would always be there to fix that.

During World War II Norbert Wiener headed a multidisciplinary research group whose goal was to create a machine that could predict an aircraft's position based on its past movement patterns. He stated that 'humans acting under stress

tend to perform repetitively and therefore predictably' (Galison, 1994, p.236) This machine, the AA (antiaircraft) predictor, soon extrapolated the context of war and became, for Wiener and other members of the scientific community, 'the prototype of a new behaviorist understanding of the nervous system itself'. (Galison, p.242) With a strong belief that the human mind could be re-created artificially, the Teleological Society was born, having its first meeting in January 1945. The Teleological Society got his name from its main members Howard Aiken, Norbert Wiener and John von Neumann and would represent 'a new vision of the world that was to emerge from this secret confluence of war sciences, one that would embrace matters of "engineering, physical, and even economic and social interests."' (letter from Wiener to von Neumann, quoted from Galison, p.248) Its main objective would be to study and discuss purposeful behavior and the functioning of human mind.

The idea of thinking machines, as exposed above, presupposes a high level of similarity between humans and machines. In the period when the first computers were being made and used, the war was funding scientific research, being therefore highly influential in the scientific mindset and agenda. Turing's instruction tables and the men-machines at war represent one aspect of human existence, but certainly not all. From a military perspective, men and machine can be considered similar (Galison, 1994). The pursuit of prediction and control over human mind and human behavior are clear indicators of the authoritarian side of computer technology and it is no coincidence that it is manifested in the military environment. The computer, however, can also be a tool for freedom and individual expression, as will be examined later on this chapter.

As the World War came to an end the Cold War period began. Defeating Nazi's was seen as an incontestable noble task, but supporting a nuclear arms race seemed a different story and therefore it brought some questions about the moral aspect of computer and Cybernetics research to the American scientific community. Wiener considered that scientists should not support the nuclear arms race. At this point, Wiener had also a critical position regarding sentient machines, disagreeing with Turing in his optimism for the future of artificial intelligence (Barbrook, 2007). Wiener's contemporary, John von Neumann, had a different position regarding these issues.

"As their politics diverged, Wiener and von Neumann began advocating rival interpretations of cybernetics. In its left-wing version, artificial intelligence was denounced as the apotheosis of technological domination. When he formulated his right-wing remix, von Neumann took cybernetics in exactly the opposite direction. Tellingly, his interpretation emphasized that this master theory had been inspired by the prophecy of thinking machines." (Barbrook, p.47)

This dichotomy, such a prime product of Cold War mentality, is in the core of the question being discussed in this thesis. It offers an important perspective to use in the comprehension of the history of computing. However, if on one hand, it indicates the existence of — at least — two different possibilities and therefore invalidates the idea of 'one possible, natural outcome', on the other hand both operate under the binomial salvation/destruction. Nevertheless, it attests the importance of human intentions as opposed to a natural neutrality in regards to the implementation of technology.

Furthermore, it highlights the ideals underlying the model defended by von Neumann: the future — and salvation — of mankind lies on the advent of thinking machines. These machines belong to a world where human behavior is similar to machine behavior, meaning that human behavior can be predicted (programmed). If humans and machines are equivalent, humans can be replaced by machines if these are more efficient.

Galison argues that 'the cultural meanings of concepts or practices [...] is indissolubly tied to their genealogy'(p.264). In this sense, it is of extreme importance to track cybernetic devices back to their origin in war sciences. That does not mean, however, that the logic of war will necessarily be forever present in cybernetics devices or structures nor that all code is synonym for control and oppression. As Galison states, 'cultural meaning is neither aleatory nor eternal.'(p.265)

N Katherine Hayles, in 'My mother was a computer' (2005), carefully investigates the ambivalent nature of computers within the realm of code and natural language. The apparent opposition between them is transformed into partnership, making it very clear why people cannot afford to ignore code nor to allow it to a restricted group of software engineers. 'Code is not an enemy, any more than it is the savior. Rather code is increasingly positioned as language's pervasive partner. Implicit in the juxtaposition is the intermediation of human thought and machine intelligence, with all the dangers, possibilities, liberations, and complexities this implies.' (p.61)

By connecting computer code to natural language Hayles portrays a computer that is radically different from the military computer. She also portrays a different kind of human being (not predictable nor programmable) and a different relationship with computer technology: rather than a tool to exercise control, she sees a partner.

Computers through time

In the late 40's, computers were as big as a medium-sized apartment and used punched cards as data input and output. The manipulation of switches and cables worked as programs, which aimed at solving military problems (more specifically, fire-control systems and missile trajectory calculations). It could take days for setting up the switches and cables. A machine like this is not meant for mass scale production — due to its use, its cost, its size, it was designed and built for government use.

Remington-Rand's UNIVAC was one of the first commercial computers, being used by the U.S. Census Bureau but also by private businesses, such as Insurance Companies. A TV advertising [7] shows a long and very detailed description of how the computer works and while highlighting the fact that the computer would do the tasks automatically, it also includes information about features related to checking data transcription and to allowing for direct and manual access to the system in case of eventual inconsistencies. It is interesting to note that at this time — when computers started to shift from the governmental and institutional spheres to commercial companies — the trust on computers by the a less specialized group of users still had to be gained. This is nowadays taken for granted: the computer is pictured as reliable and precise, no questions about its accuracy are posed - even though bugs and errors still do happen.

With the changes in the size, speed and price of the computer, changes to the user and to the interaction interface came along. The possibility of making a smaller machine for a smaller price put computers inside companies, to perform tasks such as payroll. In the early 50s, IBM was the company behind the first mass-produced computer: the IBM650 - also known as the Magnetic Drum Machine. Its Manual contains not only descriptive information, but also a quite detailed explanation on how to program the machine. Contrary to its predecessors, which were aimed mostly at large government agencies, such as the Census Bureau, the Magnetic Drum Machine was designed to be affordable and easy to use. It was cheap (and discounts for universities were possible), small (would fit in one room) and easier to use (programmed in decimal rather than in binary). [8]

Another important characteristic that links early computers to governments, institutions and big businesses is their method of operation: batch processing. Due to the cost of the computer, it was unthinkable to allow the processor to be idle. In order to optimize processor time, programs would be written offline and queued for execution. Programmers would wait until the batch was run and only then they could retrieve the results. Any revision or fix in the program would have to be queued again. In batch processing machines, there were programmers and operators. Strictly speaking, it was not until the advent ot time-shared machines that the user came to exist.

Time-sharing was implemented in the early 60s allowing multiple users to share the computer's processing resources. While one single user would not make an efficient use of the computer, multiple users would. The cost would then drop, allowing not only institutions, governments and big businesses to use computers. The birth of the personal computer is strongly attached to the advent of time-sharing/multi-user computing as it allowed for interactive use. Time-shared/multi-user computers would give the user the illusion that all the computer resources were at her disposal, without the need to wait long periods of processing, as it was the case with batch processing computers.

Paul Ceruzzi (1998, p.208) points out an interesting occurrence of a mainframe computer being used personally, i.e., for fun, not for business. Stewart Brand (publisher of the Whole Earth Catalog) saw a group of people at the Standford Artificial Intelligence Laboratory playing Spacewar, a computer game, in a PDP-10, which was, in terms of hardware, not at all similar to what later came to be the personal computer. It costed around half a million dollars and took up a room in size. It was PDP-10's support for interactive use (defined by its design) that allowed this kind of personal use.

But time-sharing alone would not 'transform' the computer into a personal computer. Across the 60s, 70s and early 80s, a myriad of events and factors combined would be acting upon that. From the microprocessor to hobbyists groups (Homebrew Computer Club and pocket calculator owners being important examples), from new programming languages like BASIC to the invention of the mouse by Douglas Engelbart, from the research on Graphical User Interfaces (GUI) done in places like Xerox Center to manifestos like Ted Nelson's Computer Lib, from the the counterculture movement to the development of Operating Systems - the personal computer is the result of the interaction of all these factors and agents.

Even though very little has changed in the realm of GUIs after the mid 90s, when the GUI was revamped through the possibility of overlapping windows (except for some minor make up, such as making icons glossier and providing animated transition effects), the 'evolution' of the personal computer did not cease at the original advent of GUIs. Even though touch screens were already available in PDAs at the late 90s, its breakthrough would only come around two decades after that. This clearly shows, again, that the 'success' of a feature or device is not a purely technological question. The technology was available, but the feature did not have relevance in the immediate upcoming devices if compared to its relevance in a product like iPhone or iPad, where touch screens became so relevant that a new grammar of gestures was implemented (see Fig.3).

In 2007, Apple brought the iPhone to the market, consolidating a new set of definitions for the triangle user - computer - interface. This device brought the idea of a personal computer to another level. It is very easy to use, which means it could be used by anyone and it could be sold on a much bigger scale. Also, if desktop PCs would eventually be shared among family members, for example, iPhone is a truly personal device in the sense that it is owned and used by one individual only (which made the sales prospections even more promising). It is small and light enough to be carried inside a pocket and the tasks it performs are not only related to office work but also strongly related to interpersonal communication (email, phone, messages and use of social media services). Apple's approach regarding the computer is based on Steve Jobs' definition of it: 'the personal computer should be like an appliance. With the Apple II and then, more notably, the Macintosh in 1984, Apple pioneered the practice of creating machines that users were not supposed to open and fiddle with their inwards.' (Isaacson, 2014, p. 252/253)

This approach does not refer only to hardware: Apple's position regarding the use of software in the iPhone is also one of centralized control. The prohibition of pornographic content and the need to have Apple's Store approval for installing Apps (short name for Application, a program) are clear examples.

The iPhone was followed by the iPad, in 2010. In the iPad, the same conceptual model was implemented: the appliance computer. I have to mention that desktop and laptop computers are still relatively accessible to the user, specially if compared to smartphones and tablets — at least when it comes to software management. These devices are an embryo of the information appliance device, the 'thing' in 'the Internet of Things'. They are the kind of product which according to Donald Norman in his book The Invisible computer represents the future of computer as its technology enters 'the mature phase' (Norman, 1998). "In the mature market, new classes of customers emerge: the mass market. These are the pragmatic, conservative customers who wait until the technology settles down, who wait until they can get value for their money with a minimum of fuss and bother. They want results." (Norman, 1998, p. 39) Advancing a few pages, Norman reminds us that "when computers are embedded within information appliances, they can perform their valuable functions without the user necessarily being aware that they are there." (Norman, 1998, p.56)

In the devices just described, the interface's user-friendliness — in some cases a combination of graphics, touch screen and 'gestures', in other cases interaction through voice — is one of its most important selling points. But for a whole generation of computers to come, this mode of interaction is not regarded as

ideal by their designers. These designers, whose main spokesperson is currently Samsung's employee Golden Krishna, are in favor of the 'no-interface'. In a lecture to promote his ideal [9], his argument pro no-interfaces is a situation where an app is much less appropriate than a RFID (Radio Frequency Identification) sensor to be used as a car key. Without mentioning the fact that a 'real, old-fashioned' car key could perform the same benefits as the digital key, he tries to convince us of the wonders of living in a smart world. In this world, humans are not required to do much. Assuming for a moment that this is a positive thing, still it is only a partial view. The price to pay usually does not receive the same importance in the description of the concept. Most of all necessary input will be given in our names through the harvesting of our personal data, since that's where all the autonomy of smart computers is based on. In short, no interface means less privacy.

Chapter Two

User-friendly

In his paper 'Sandbox Culture' (2015), Aymeric Mansoux describes what he calls a sandbox environment: by running in an Android system a few UNIX commands that inform what your username is, which directory is your home and which groups you, as a user, belongs to, he shows that the user is no longer a user, but an App (p. 18). If in Android the user is treated as an App, in the iPhone the user has to perform an operation known as 'jailbreak' in order to re-gain power within the device's hierarchy. This operation is done by installing a software to 'unlock' the device, giving back user status to the user. In Apple's smartphones and tablets, it's just after jailbreaking that it is possible to gain full access to one's own device and use it according to one's will — including the ability to download software from other sources other than Apple Store.

By jailbreaking, iPhone owners lose Apple's guarantee. A jailbreak tutorial website clearly puts what is at stake: if the owner is up to taking risks, the rewards pay off. 'Problems can be solved, but freedom of choice is something you either have or you don't.' [10]

In this context, it is easy to see how the famous Apple motto 'it just works' can be successful only under 'safe' conditions. These conditions could be translated into:

- simplifying the interaction/interface
- impoverishing the role of the user in the system
- controlling the installation of software
- not allowing the owner to fiddle with the hardware
- making it all look good and well-intentioned

Traditionally, only the first item on the list above would be considered user-friendliness. I argue that the whole set of measures adopted by Apple in the implementation of the appliance computer can be considered user-friendliness, in the sense that they all contribute to the experience of the computer being easy to use, a computer that 'just works'. For the motto to correspond to the truth — and therefore produce satisfied customers — the whole set of measures listed above is needed. Less intervention from the user in the system makes the experience smoother. Less 'unknown' software will also make the experience smoother. In short, all these measures provide an environment which is as much user-friendly as it is controlled by the product/operating system manufacturer (in the case of Apple, the company is both), and not by the user.

Publicly disclaiming that a device meant to empower creativity was designed to work under tightly controlled conditions does not sound appealing from a marketing point of view, as creativity should be bounded to freedom and not to rigid control mechanisms according to the marketing discourse around these

devices. Security and productivity (translated into saving time) are the qualities usually invoked whenever a decision involving some kind of control measures needs to be communicated. It's not different in the case of the appliance computer: users are told that computers became too complex but the good news is that they are free from the hassle of having to deal with that. All they have to do is leave the technology to the specialists. It is certainly interesting to discover that statements that theoretically defend human values and pretend to be claiming a less technocratic and more democratic society actually implement a model that represents technocracy as its very best.

The set of measures that contribute to the effective success of a product design can be easily found in business-oriented literature. Technology, Marketing and User Experience are 'the three legs product development in the mature, customer-centered phase of a product' (Norman, 1998, p.40). A three-legged stool exemplifies the successful foundation for a technological product. It is, thus, relevant to analyze a product such as the iPad through its marketing script, its technical/architectural specifications and the interaction(s) it affords.

user experience. All three legs provide necessary and complementary

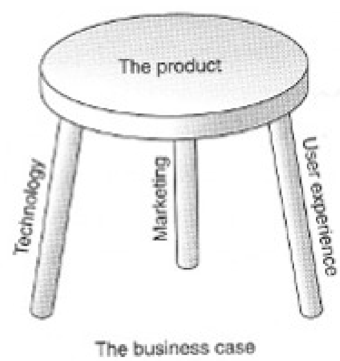

Figure 2.5
The three legs of product development in the mature, customer-centered phase of a product. When the technology matures, customers seek convenience, high-quality experience, low cost, and reliable technology. A successful product sits on the foundation of a solid business case with three supporting legs: technology, marketing, and user experience. Weaken the foundation or any of the legs and the product fails.

Fig. 2: The three legs business case

In iPad's trailer, Apple states that technology is magical and should remain invisible. That is, of course, advertising language. But as Maurizio Lazzarato points out in his 'Strugle, Media Event' (2003)[11], 'language, signs, and images do not represent something, but rather contribute to making it happen. Images, languages and signs are constitutive of reality and not of its representation.' (p. 2)

In reality, technology is not invisible in this device, but rather locked and inaccessible. The device is not magical, but a machine designed with limitations and controls of many kinds to assure a low margin of 'failure' which would not only unveil the magic but require the user to possess a couple of problem-solving skills and knowledge. If the user is capable of using her own computer fully and of solving eventual problems that might happen, she will be able to realize that many of the 'features' promoted as essential might in reality be not so essential. She may then reach the realization that, in fact, the opposite is true — some essential features are missing. The user would be able to gain independence.

Being advertised as the opera prima of omnipotence, the device could actually be defined as its opposite: an ode to impotence.

Natural

One important aspect of the attempt to 'upgrade' the terminology lies on a supposed 'naturality': the system should be easy to use, natural, intuitive as anything that we do that does not require any training or instruction. (Norman, p.158 and 174) The idea of a 'natural' anything excludes any human intervention. It is a perfect pretext for the accommodation of the combined ideas of invisibility and magic. It is a contradiction that human-centered values are put side by side with such a thing as nature, as if they were synonyms, since the history of mankind has been a continuous attempt tame nature.

The idea of a 'natural' permeates other meanings of this ideology (Emerson, 2014, p.XI) or marketing approach, if you prefer. It suggests the existence of one single possible solution, the only possible result. It treats the computer itself as the result of an evolutionary process, as if no alternatives were possible. This is, of course, opposed to the fundaments of design process and completely denies the 'potentialities of technology' (Feenberg, 2002). In this narrative, technology is seen through a deterministic lens, instead of considered as an ambivalent process, through which political positions are translated into norms, uses and actions.

A few other concrete manifestations of the importance of the 'naturality' within this system can be found in a brief look at Apple Design Guidelines (also known as iOS Human interface Guideline) and Google Material Design, aimed at App developers with the purpose of unifying users' experiences through a set of standards in graphics appearance and interaction modes.

These standards are linked to a 'naturality' in two ways: by using gestures instead of buttons (which must contain words, or at least icons), the language used in the communication is of a much more primitive nature. Primitive as opposed to civilized, that is, as synonym for natural. In some cases — not all — the gesture also resembles a movement that would make sense if the action were to take place in the physical world (flicking photos to the left or right in album, for instance).

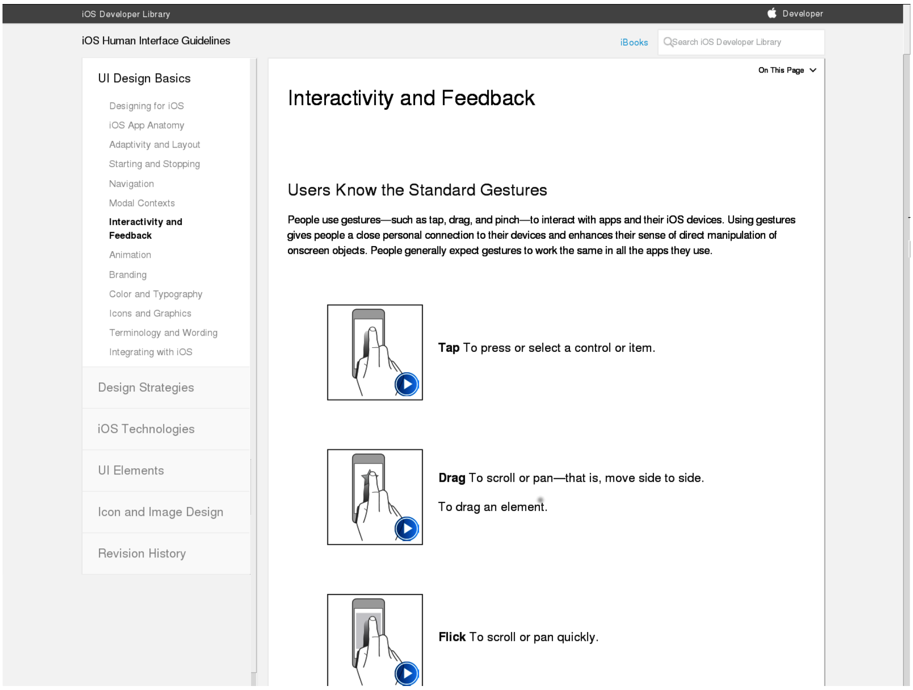

Fig. 3: iOS Human interface Guideline - Gestures

The other link to naturality is achieved by the use of a consistent and coherent system to 'create hierarchy, meaning, and focus that immerse one in the experience' [12], as can be seen in Google Material Design Guidelines below.

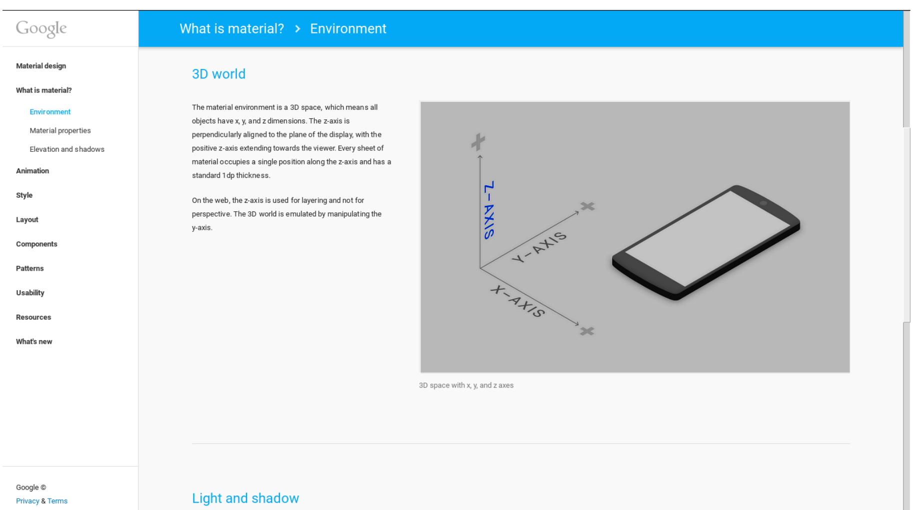

Fig. 4: Google Material Design - 3D World

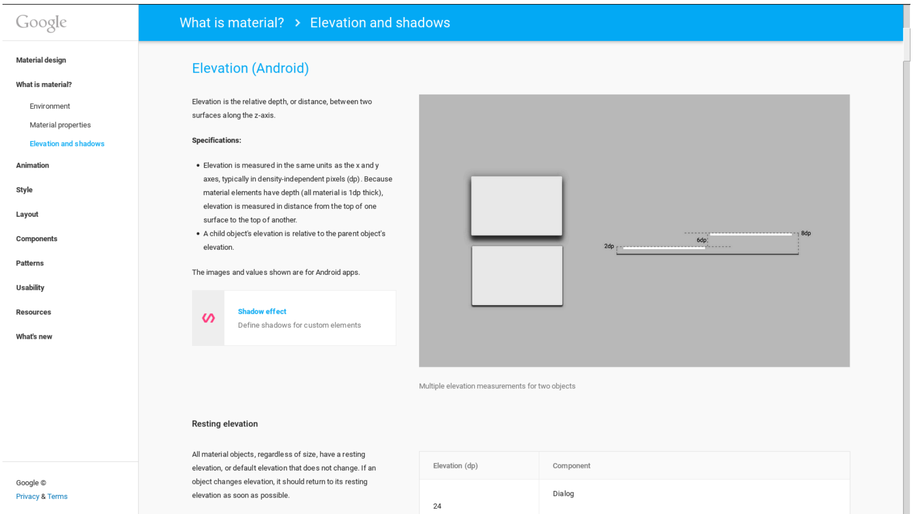

Fig. 5: Google Material Design - Objects in 3D space

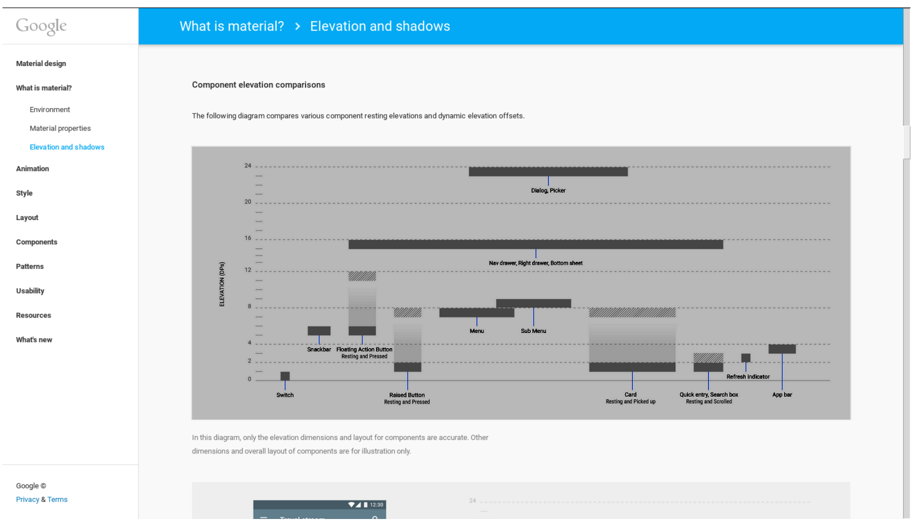

Fig. 6: Google Material Design - Objects in 3D space

Magic

The idea of 'magic' is closely related to the 'natural' in the sense of removing any evidence of (human) intention from the product design.

Bruce 'Tog' Tognazzini (former Apple interface design team member) literally states in his 'Tog on Software Design' (1996, p.291) that 'perhaps no other field other than magic is so closely related to the field of graphical interface design'. He argues that the illusion is a necessary component of the interaction between humans and computers. I cannot totally disagree: in order to be able to interact with the bits and bytes, some kind of illusion environment is needed (call it conventions of metaphor if you prefer). But that does not mean to say that the

user illusion has to be kept at all costs. Contrary to what Tognazzini defends (Tognazzini, p.300), I don't support a model where the illusion cannot evaporate.

Lori Emerson summarizes it quite well: 'simply because something has the ability to move to the periphery of our attention does not preclude us to understand how it works'. (p.9) For her, the magical touch in smart devices refers to the fact that they 'hide their inner workings through glossy, attractive packaging' which in turn brings the device to the center of attention while becoming itself a 'fetishistic object' (p.11 and 13).

A different perspective can be found, for example, in Alan Kay - responsible in the 70's for the GUI, then a new approach towards Human-computer Interaction. His idea of the GUI as a valuable educational resource is clearly explained in 'User interface: A Personal View' (1989), where he explains that his understanding of the computer as a medium rather than as a tool meant that users should be able to read and write it. "The ability to 'read' a medium means you can access materials and tools created by others. The ability to 'write' in a medium means you can generate materials and tools for others. You must have both to be literate." (p. 125) His proposal for DynaBook [13], the portable computer in the size of a book, designed 'for children of all ages', puts the educational value of computers at a central spot and regards its user as 'an active agent, a creator and explorer, [...] far more capable intellectually than is generally supposed'. (p. 4) It is a document that shows the user being regarded as intelligent, active and capable. Therefore, the Graphical user interface is seen as a way to enhance knowledge - not simply a shortcut to a task. Even though it should facilitate tasks by simplification, it should also allow complexity.

In an interview to Time Magazine [14], Kay acknowledges that in a consumer society, there is the desire to have no learning curves.

"This tends to result in very dumbed-down products that are easy to get started on, but are generally worthless and/or debilitating. We can contrast this with technologies that do have learning curves, but pay off well and allow users to become experts (for example, musical instruments, writing, bicycles, etc. and to a lesser extent automobiles)."

Confronting Kay's ideas to Steve Job's positions regarding a computer, it becomes clear that in the appliance computer, the user should be given limits within exploring the machine - the active, curious user is not welcome. The user to which this computer was designed (and which this computer shapes) is passive, unable and apathetic.

Smart and Personal

If in the 'appliance computer' its user-friendliness helps distract the user from the fact that she does not have much power over the device, in a situation of ubiquitous computing (ubicomp) — the Internet of Things (IoT), smart devices (or territories) and 'no-interfaces' — this power imbalance may potentially be even bigger — and proportionally, the interpretation of user-friendliness I have been questioning is also extensively more present.

When interfaces are removed from processes causing actions to be triggered autonomously through the gathering and analysis of user data (actions that would otherwise be performed by the user's click of a button, for example) the decision-making step is transferred from the user to the machine (or to the program, to be more precise). The user becomes less involved in it, performing the role of a spectator, or a consumer. Once again, what can be seen is a situation where the user is removed from the stage, being replaced by the program.

By automating minor management tasks from our daily lives, humans can eventually lose the right to make these small decisions. Evgeny Morozov ('To save everything, click here', 2013) describes a situation where data 'becomes the policy', since the numbers are used as direct justification for (and immediate implementation of) actions. He criticizes what he calls 'solutionism', which is the tendency to view problems exclusively through the lenses of technology and propose a solution to it that does not consider any moral/political/socio-economical aspect. This modus operandi contributes to the idea of a 'universal truth', an unquestionable decision, a neutral, unbiased position. Once again, an attempt to remove any signs of human intervention.

Win-win

From a commercial perspective, the idea of invisible technology and magical panes of glass is extremely profitable. It simultaneously removes the conflicts from the consumer's sight and creates a dependency on keeping the experience smooth. Invisible technology transforms users into consumers and channels them to the product.

Invisible technology is also smart technology, which is built on the access to user's data. The use of smart devices, infrastructures and services guarantees the flow of data, which is an essential asset in the economic model being discussed. But the collection and analysis of large amounts of user data does not bring benefits only to business. Since the end of the 19th century, governments have been using numbers and statistics to implement and justify their policies. Agar, quoting John Brewer (2003, p.4) says: 'the power of governments has always been and always will be in large part dependent upon their capacity to order and manipulate different sorts of information.' (User, consumer, citizen) data is valuable from a politico-economical perspective.

Chapter Three

In this chapter, I intend to show why it is important for the user to be able to 'see' technology.

As discussed in the previous chapter, the mantra of invisible technology is supported by three main strategies:

1. an attempt to remove signs of human intervention from technology and give it a 'natural event' status;

2. an attempt to make the user believe she is empowered by the device (or service, or technology), since it is so easy to use and accessible by everyone;

3. an attempt to ensure the flow of data.

Like in the case of the iPad described in Chapter 2, the interdependency of these aspects is crucial to the success of the whole idea.

The first stream has the following implication: when there is no trace of intention, there is no possibility for accountability. If the outcome is the only possible, there is no 'right' and no 'wrong', nor 'better' or 'worse', no 'maybe', no possible alternatives. There is only the 'truth' and therefore it is unquestionable. Furthermore, this truth is optimal.

The illusion of having 'no-choice' is itself made possible by someone's (design) choice. In a system designed to perform as 'the truth', the users will be discouraged to question it. In a different situation — which would be a system where the decisions are clearly stated, the reasons and consequences are clearly addressed — the possibility for questions and debate is infinitely bigger. But why would a lack of debate be beneficial? Who would profit from it? This invisible technology, based on magic, locked devices and good intentions, contributes to a strong imbalance in power: on one side, the ruling group — which creates and implements code and policies, which designs and manufactures devices; on the other side, the ruled ones — who buy the devices and contribute with their data, improving the efficiency of the system through its feedback loops.

The second strategy diverts the actual decision 'center'. If human intentions are not part of the design and the device (or service, or technology) represents an empowerment, then the user is supposedly in control. Perversely, by putting 'so much power' in the user's hands, all eventual accountability — for success or fail — is transferred from the system designer to the user.

I see the correlation between these two strategies as an interesting and powerful combination of the dream of omnipotence versus the concreteness of impotence.

The third strategy aims at keeping the system functional. I reckon that collecting, analyzing and trading data is the main purpose, the end goal of the system's design ('system' here is understood as a device, service or technology). Data is

a valuable asset, desired by governments and businesses, as discussed in the previous chapter. The disappearance of the user combined with the harvesting of data could be translated as alienation —in both political and economical scenarios, allowing for control and exploitation.

We believe technology is at its very best when it's invisible.

It might be a good moment to recall that humans were computers before computers were defined as the machines that do the work that humans cannot (or do not want to) do, which resulted in humans becoming superfluous regarding those tasks. Having the machines do all the work — and the thinking — while humans happily enjoy life seems to be a dream of mankind. Based on that and on the widely known phenomenon of increasing automation of labour taking place in our society at this very moment, I suggest examining a few contemporary products under the light of efficiency and user-friendliness, making a correlation with smart devices and invisible technology.

A product like iPad is part of this dream by giving humans more time 'to do the things that really matter', in exchange for knowledge/control. Users (people!) should leave the boring, complicated stuff to Apple and just enjoy. Google Now provides information to users even before they realize they'll need it, in exchange for data — which will be produced 'anyway', meaning an optimization of existing resources. The examples are nearly endless. What they all have in common: they do the work — or the thinking — for us. They save us time that will be used on different, better ways.

The flexibility of working hours and working space, a phenomenon made possible by the Internet and mobile devices, plays an important role in the definition of 'free time'. These technologies made the labour market more competitive through the advent of automation. Work performed by machines — or programs — costs less than the same work performed by humans. Machines can work faster and more precisely than humans and they do not have worker's rights. This competitive and shrinking labour market is definitely part of the reason why most humans need to save time in the first place.

Another set of services provides not time, but money. Services like Uber and AirBnb use human data and networked communication technology to convert personal 'infrastructure' into tradable goods or services. Also in this case, both the users' data and their personal 'infrastructure' (car, house, dinner) would not demand any extra work, effort or investment. users should 'monetize' their existing houses, cars, dinner meals, etc. Once again, the effect of a competitive and shrinking labour market can be linked to services like these. But there is another important correlation between these services and labour market.

Just like humans become superfluous when a machine can do their jobs, companies can become superfluous when technology enables users to monetize on their personal infrastructure — specially because users don't have to make investments nor pay worker's rights, social insurance, etc. When companies become superfluous, their employees also lose their jobs. So, just like humans need more time due to the effects of automation in the labour market, in many

cases human data and personal infrastructure is the only currency left to trade also due to the effects of automation in the labour market.

But the negative effects do not extend to all layers of society. Just like in pyramid schemes, where high profits are promised at low costs but in reality just the ones on the top of the pyramid will benefit from the structure while the middle will have some profit and the bottom will pay the bill, one small group is harvesting the good crop.

What defines the position one will occupy in the pyramid is precisely the knowledge one has about the structure. Invisible technology, as promoted in the examples discussed in this thesis, contributes to asymmetry in power by rendering it difficult for the ones in the bottom of the pyramid to change their situation. 'By removing our knowledge of the glue that holds the systems that make up the infrastructure together, it becomes much more difficult, if not impossible, to begin to understand how we are constructed as subjects, what types of systems are brought into place (legal, technical, social, etc.) and where the possibilities for transformation exist.' (Ratto, 2007, p.25) Without the possibility to address issues or question accountable individuals or companies, there is little chance of change.

What we see when investigating the motivations and consequences of this version of invisible technology is an ideology that contributes to the maintenance of privileges and control in the hands of a small group. Economically speaking, this group can be identified as the tech minds of Silicon Valley — Amazon, AirBnb, Apple, Facebook, Google and Ubber among others. Politically speaking, this group can be identified as governments. The problematic aspect of control in this case refers to the collection, analysis and use of personal data without the citizen's awareness or consent.

Conclusion

I refuse the deterministic idea of the implementation of technology as a natural, incontestable fact. Rather, I believe that it is an ambivalent process, the result of a negotiation between social, political, cultural, economical and technical vectors. Therefore, it is necessary that technology is visible and the decisions involving the implementation are clear. Without visibility, there is no possibility of debate. And without debate, there is no democracy.

Under this perspective, the kind of technology that results from such a context can be portrayed as populist and elitist rather than as democratic. Decision-making processes and actions are transferred from the user to the designer of the system, making the user become superfluous and lose her agency. This is how power asymmetry is engendered: deprived from having a voice within the system, the user's value lies solely on being consumer (of devices and apps) and supplier (of data). The system designers, on the other hand, possess the means and status to alter the system according to their interests and are able to capitalize on that.

Due to the ambivalent and dynamic nature of technology, that does not mean to say that there is no way out. However, as Donald Norman also acknowledges, 'nothing worthwhile is easy' (p.230). While user-friendliness and ease of use stay synonyms for alienation and ignorance of how the system works, the power imbalance will tend to prevail. When, instead, user-friendliness and ease of use mean knowledge, change becomes a real possibility.

Illustrations

Fig. 1 - Human Computers
http://chsi.harvard.edu/markone/about.html

Fig. 2 - The three legs business case
Norman D. (1998) The Invisible Computer p.40

Fig. 3 - iOS Human interface Guideline – Gestures **https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/InteractivityInput.html**

Fig. 4 - Google Material Design - 3D World
https://www.google.com/design/spec/what-is-material/environment.html

Fig. 5 - Google Material Design - Objects in 3D Space **https://www.google.com/design/spec/what-is-material/objects-in-3d-space.html**

Fig. 6 - Google Material Design - Objects in 3D Space **https://www.google.com/design/spec/what-is-material/objects-in-3d-space.html**

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Notes

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